

## AMENDMENT &amp; RESPONSE UNDER 37 C.F.R. § 1.116 - EXPEDITED PROCEDURE

Page 2

Serial Number: 09/132,157

Dkt: 303.229US2

Filing Date: August 11, 1998

Title: SILICON-GERMANIUM DEVICES FOR CMOS FORMED BY ION IMPLANTATION AND SOLID PHASE EPITAXIAL REGROWTH

24. (Six times amended) A p-channel metal-oxide-semiconductor transistor formed on a silicon substrate, comprising:

a  $\text{Si}_{1-x}\text{Ge}_x$  channel region, having a germanium molar fraction of  $x$ , and formed in the substrate, underneath a silicon dioxide ( $\text{SiO}_2$ ) gate oxide and between a source region and a drain region;

wherein  $x$  is less than or equal to 0.6, and wherein the  $\text{Si}_{1-x}\text{Ge}_x$  channel region forms a continuous  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface wherein no germanium oxide is present at the  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface as a result of ion implantation of germanium through the previously formed  $\text{SiO}_2$  gate oxide.

25. (Five times amended) A p-channel metal-oxide-semiconductor transistor formed on a silicon substrate, comprising:

a  $\text{Si}_{1-x}\text{Ge}_x$  channel region, having a germanium molar fraction of  $x$ , and formed in the substrate, underneath a silicon dioxide ( $\text{SiO}_2$ ) gate oxide and between a source region and a drain region, wherein  $x$  is less than or equal to 0.6, and wherein the  $\text{Si}_{1-x}\text{Ge}_x$  channel region forms a continuous  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface wherein no germanium oxide is present at the  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface as a result of ion implantation of germanium through the previously formed  $\text{SiO}_2$  gate oxide; and

wherein the  $\text{Si}_{1-x}\text{Ge}_x$  channel region is formed from ion implanting germanium (Ge) into the substrate at a dose of approximately  $2 \times 10^{16}$  atoms/cm<sup>2</sup>, and wherein the Ge is implanted at an energy of approximately 20 to 100 keV.

28. (Six times amended) A p-channel metal-oxide-semiconductor transistor formed on a silicon substrate, comprising:

a  $\text{Si}_{1-x}\text{Ge}_x$  channel region, having a germanium molar fraction of 0.2, and formed in the substrate, underneath a silicon dioxide ( $\text{SiO}_2$ ) gate oxide and between a source region and a drain region, wherein the  $\text{Si}_{1-x}\text{Ge}_x$  channel region forms a continuous  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface wherein no germanium oxide is present at the  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface as a result of ion implantation of germanium through the previously formed  $\text{SiO}_2$  gate oxide.

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Page 3

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38. (Four times amended) A semiconductor transistor, comprising:

a silicon substrate;

a silicon dioxide ( $\text{SiO}_2$ ) gate oxide, coupled to the substrate;

a gate, coupled to the  $\text{SiO}_2$  gate oxide;

source/drain regions formed in the substrate on opposite sides of the gate; and

a  $\text{Si}_{1-x}\text{Ge}_x$  channel region, having a germanium molar fraction of  $x$ , and located

underneath the  $\text{SiO}_2$  gate oxide and between the source/drain regions, wherein  $x$  is less than or equal to 0.6, and wherein the  $\text{Si}_{1-x}\text{Ge}_x$  channel region forms a continuous  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface wherein no germanium oxide is present at the  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface as a result of ion implantation of germanium through the previously formed  $\text{SiO}_2$  gate oxide.

40. (Four times amended) A semiconductor transistor formed on a silicon substrate, comprising:

a  $\text{Si}_{1-x}\text{Ge}_x$  channel region, having a germanium molar fraction of 0.2 formed in the substrate, underneath a silicon dioxide ( $\text{SiO}_2$ ) gate oxide and between a source region and a drain region, wherein the  $\text{Si}_{1-x}\text{Ge}_x$  channel region forms a continuous  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface wherein no germanium oxide is present at the  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface as a result of ion implantation of germanium through the previously formed  $\text{SiO}_2$  gate oxide.

41. (Thrice amended) A semiconductor transistor formed on a silicon substrate, comprising:

a  $\text{Si}_{1-x}\text{Ge}_x$  channel region, having a germanium molar fraction of  $x$ , and formed in the substrate, underneath a silicon dioxide ( $\text{SiO}_2$ ) gate oxide and between a source region and a drain region, wherein  $x$  is less than or equal to 0.6, and wherein the  $\text{Si}_{1-x}\text{Ge}_x$  channel region forms a continuous  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface wherein no germanium oxide is present at the  $\text{Si}_{1-x}\text{Ge}_x/\text{SiO}_2$  gate oxide interface as a result of ion implantation of germanium through the previously formed  $\text{SiO}_2$  gate oxide; and

wherein the  $\text{Si}_{1-x}\text{Ge}_x$  channel region is formed from ion implanting germanium (Ge) into the substrate at a dose of approximately  $2 \times 10^{16}$  atoms/cm<sup>2</sup>, and wherein the Ge is implanted at an energy of approximately 20 to 100 keV.